2010

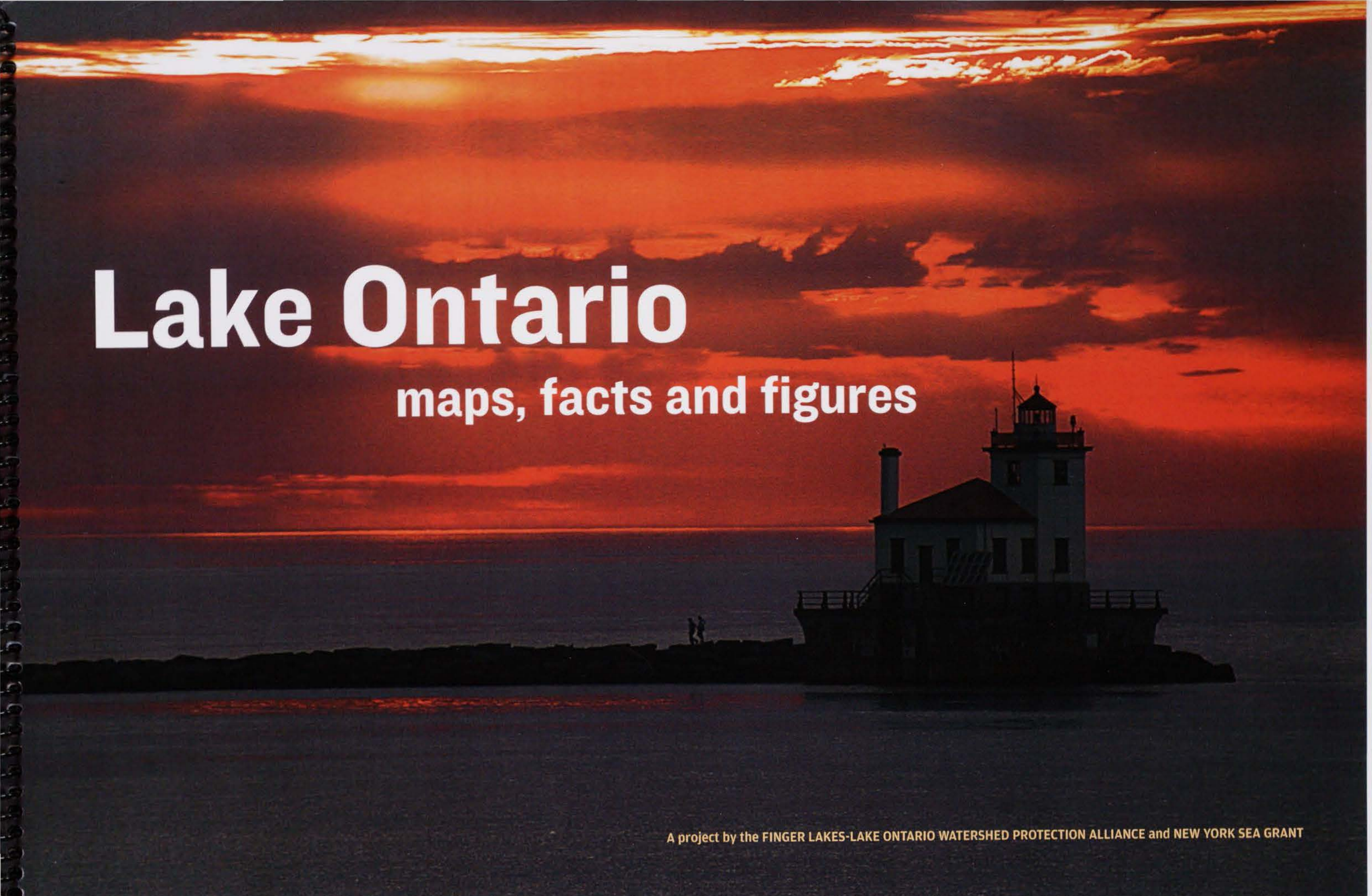
Lake Ontario: Maps, Facts and Figures

Finger Lakes-Lake Ontario Watershed Protection Alliance

New York Sea Grant

Lake Ontario

maps, facts and figures



A project by the FINGER LAKES-LAKE ONTARIO WATERSHED PROTECTION ALLIANCE and NEW YORK SEA GRANT

1. Origins of Lake Ontario Direct Drainage Basin

2. Population by Census Block Groups

3. Detailed Surface Water

4. Topography

5. Land Use Types

6. Wastewater Treatment Plants

7. Public Lands

8. Status of Municipal Land Use Controls

9. Coastal Priority Waterbodies and Areas of Concern

10. Industrial And Municipal Permitted Discharges and Drinking Water Intake Locations

11. Bedrock and Unconsolidated Aquifers

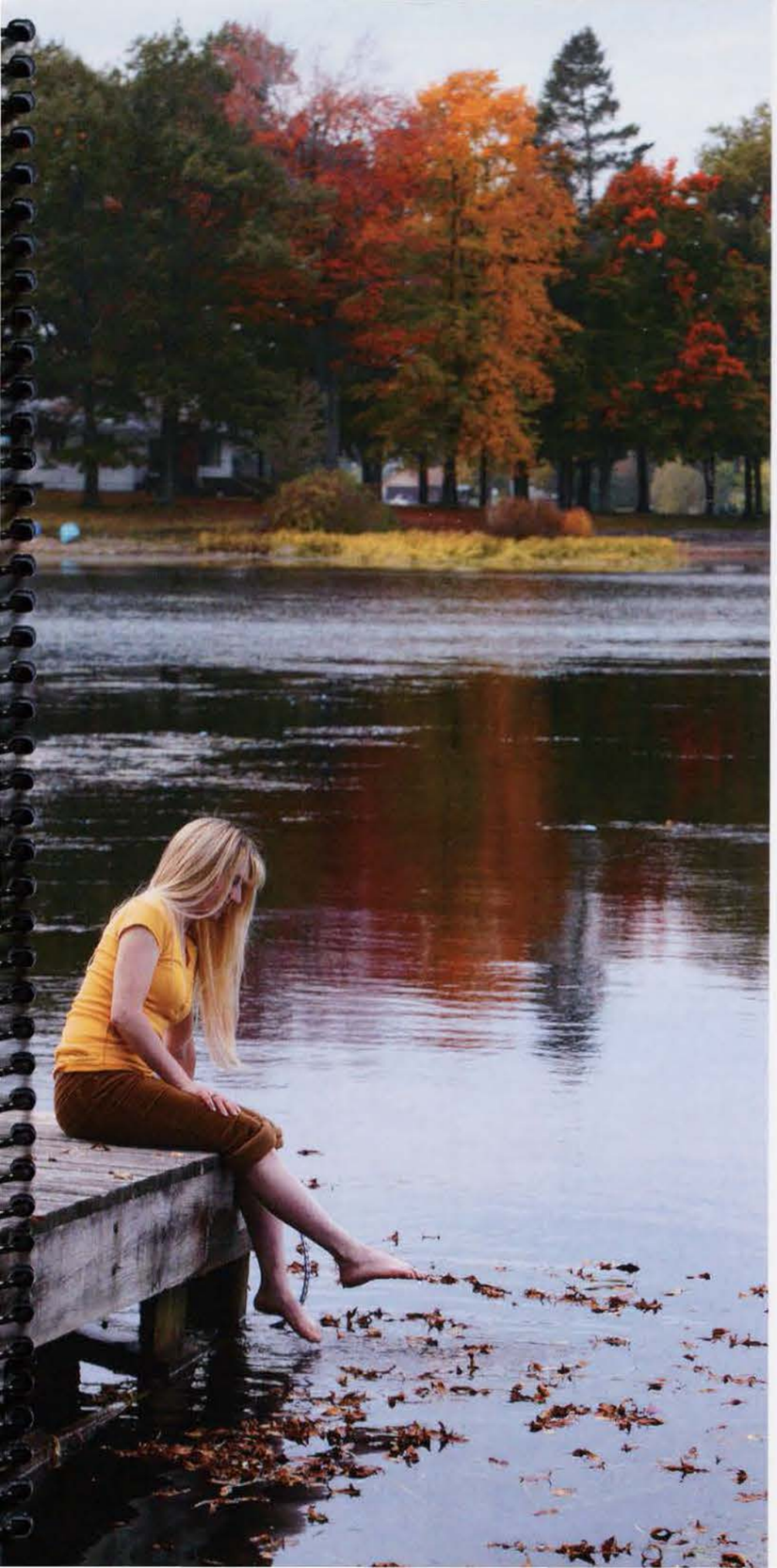
Published by Finger Lakes-Lake Ontario Watershed Protection Alliance (FLLOWPA) and New York Sea Grant.

FLLOWPA
309 Lake St. Penn Yan, NY 14527
Phone: (315) 536-7488
http://www.fllowpa.org/

New York Sea Grant
62B Mackin Hall SUNY College at Oswego Oswego, NY 13126-3599
Phone: (315) 312-3042
E-mail: SGOswego@cornell.edu
http://www.seagrant.sunysb.edu/

Acknowledgments
Writer: Helen Bagley - FLLOWPA
Designer: GARCES REID Design
Photography provided by the following agencies or individuals:
Great Lakes Seaway Trail
George Fischer
Finger Lakes Association
Finger Lakes Tourism Alliance
Jack W. Miller
Richard Young, Department of Geological Sciences, SUNY Geneseo
Brian P. Whattam
Greater Rochester Visitors Association
New York Sea Grant
Oswego County Promotion and Tourism
Thousand Islands International Tourism Council
Maps & Photography: LOCI (Lake Ontario Coastal Initiative) January 2006

COVER PHOTO: Dan Distler, Oswego County Tourism.
BACK PHOTO: Kara Dunn, Great Lakes Seaway Trail.



New York's Lake Ontario . . . shown in maps, facts & figures

Lake Ontario, the 14th largest lake in the world, is the smallest of the Great Lakes. Bordered to the north by Ontario, Canada, and to the south by New York State, it is the smallest in surface area, fourth among the Great Lakes in maximum depth, but second only to Lake Superior in average depth. The basin land area is largely rural with a significant forested and agricultural portion. The Lake is nestled between the mighty Niagara River to the west...and the picturesque St. Lawrence River Valley to its east.

Almost one-third of the land area of New York State drains into Lake Ontario, making the wise use and management of natural resources vital to the long-term sustainability of the Lake Ontario region's ecology, environment and economy.

This booklet is designed to provide those who live, work, and play along Lake Ontario with an overview of the use and management that occurs within the drainage basin. We encourage you to use this booklet to add to your understanding of the issues impacting the Lake and your management and planning activities.

The Finger Lakes - Lake Ontario Watershed Protection Alliance in partnership with New York Sea Grant developed this booklet and has made every effort to insure that the information is accurate. The maps provided were provided by the Lake Ontario Coastal Initiative (LOCI) with permission for their use. This information is provided for educational purposes only.

David G. White

Recreation/Tourism Specialist/Great Lakes Program Coordinator | NY Sea Grant

Lake Ontario at a glance

Lake Ontario is the 14th largest lake in the world.

Length: 193 mi / 311 km

Width: 53 mi / 85 km

Average depth: 283 ft / 86 m

Maximum depth: 802 ft / 244 m

Volume: 393 mi^3 / 1634 km^3

Water surface area: 7,340 mi^2 / 19011 km^2

Shoreline length: 712 mi / 1146 km

Elevation: 243 ft / 74 m

Retention/Replacement time: 6 years

Watershed includes more than 16,000 mi / 25,750 km of streams and 260 lakes.

Origins of Lake Ontario Direct Drainage Basin

Europeans first settled the Lake Ontario Basin in the 1600s. These settlers were fur traders, fishermen, and farmers. The population of the Lake Ontario Direct Drainage Basin (LODDB) greatly increased after 1823 when a major portion of the Erie Canal linking Rochester to Albany was opened. Large bays on the Lake such as Irondequoit Bay and Sodus Bay became prime fishing and recreational centers when easier access became available. At the turn of the century, industrial development and growing urbanization increased the population of the area, and with it, major ecological changes for the region.

The LODDB spans 11 counties and 80 municipalities across upstate New York. Seven of the eleven counties have frontage on Lake Ontario.

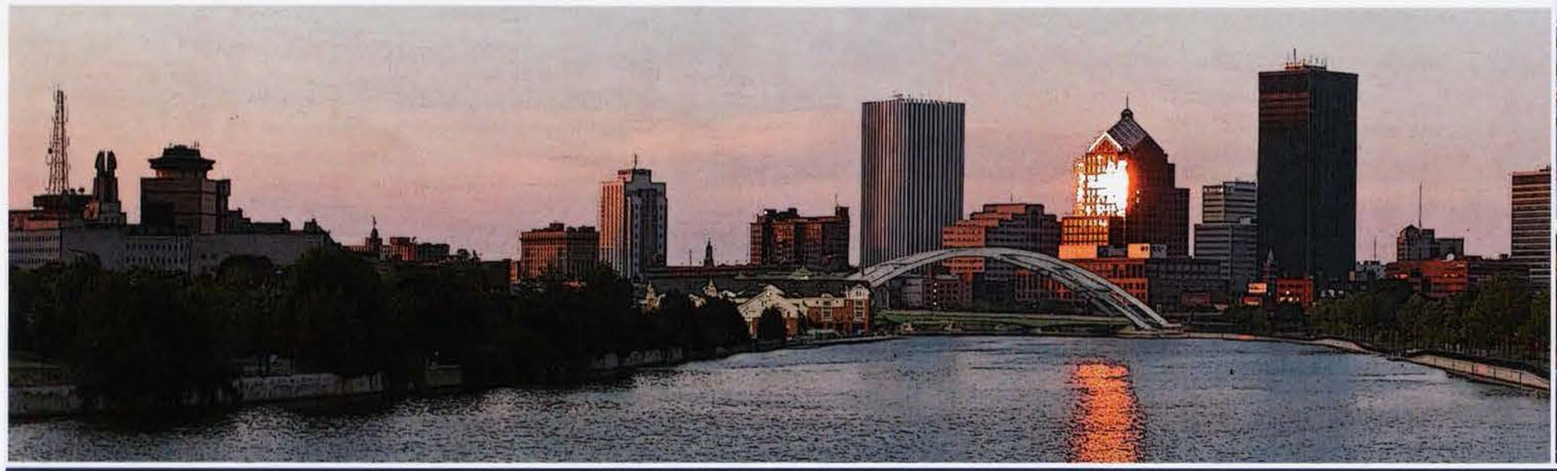
County	2009 Estimated Population	Population change 2000-2009	Estimated Land Area in the LODDB
CAYUGA*	79,526	−2,435	15%
GENESEE	57,868	−2,502	25%
JEFFERSON*	118,719	+6,981	54%
LEWIS	26,157	−787	10%
MONROE*	733,703	−1,640	30%
NIAGARA*	214,557	−5,287	60%
ORLEANS*	42,051	−2,122	98%
ONONDAGA	454,753	−3,583	5%
ONTARIO	105,650	+5,426	5%
OSWEGO*	121,377	−1,002	70%
WAYNE*	91,291	−2,475	50%

* Counties that have frontage on Lake Ontario

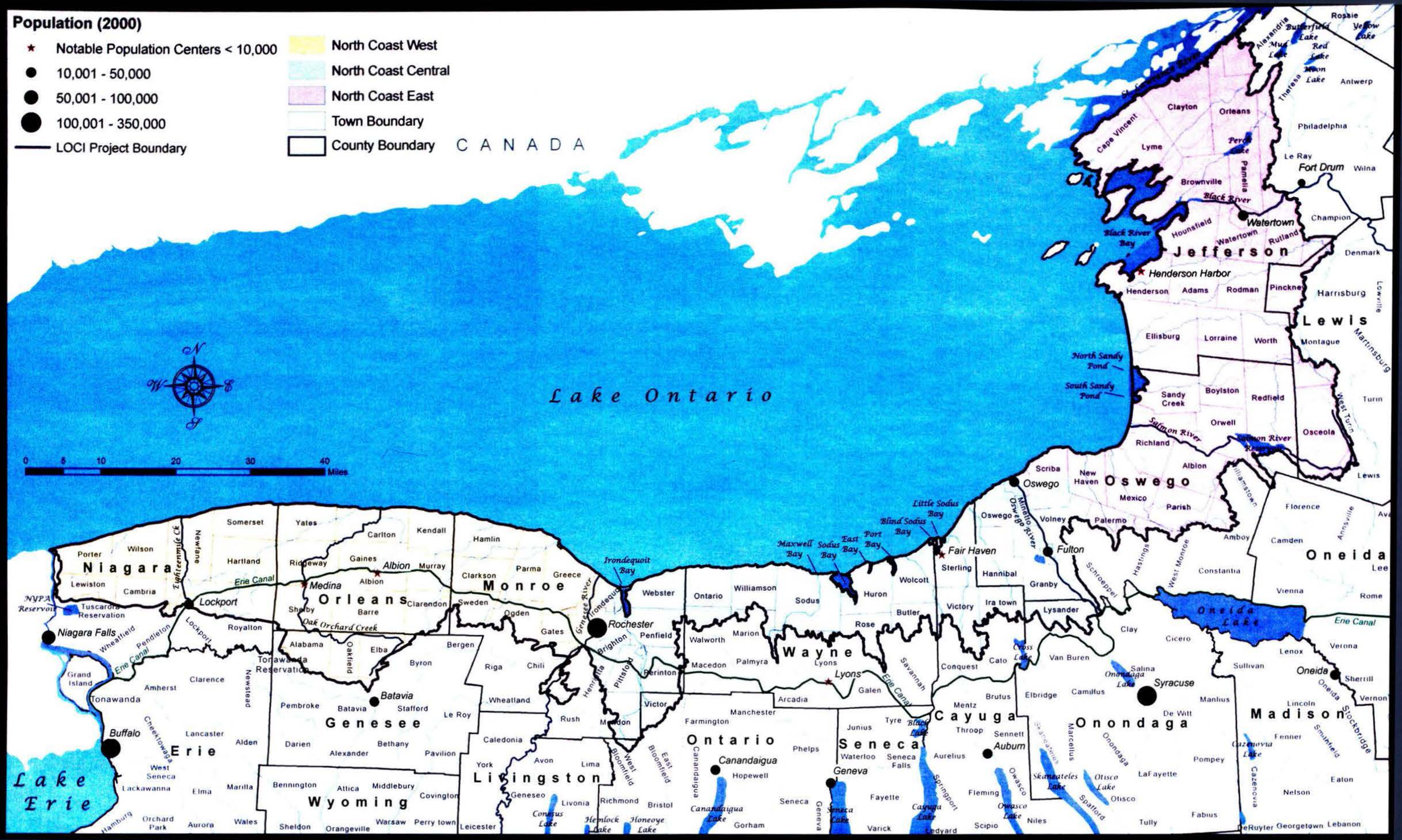
The basin includes significant urban and suburban areas. The majority of the total basin population of 751,891 (Census 2000) is located around the larger urban centers of Rochester, Watertown, and the city of Oswego. Rochester is the most populated city in the LODDB, despite decreasing by almost 6% since the 2000 Census. Monroe County, containing the City of Rochester, is the most heavily populated with Onondaga and Niagara Counties in second and third place respectively. The remaining population centers within the basin are smaller villages that largely support farming or suburban bedroom communities.

City	2000 Population	2009 Population (Estimated)	% change
BUFFALO*	292,648	270,240	−7.7%
ROCHESTER	219,773	207,294	−5.7%
SYRACUSE*	147,306	138,560	−5.9%
WATERTOWN	26,705	27,489	2.9%
LOCKPORT	22,279	20,563	− 8.8%
OSWEGO	17,954	17,177	−4.3%
FULTON	11,855	10,661	−9.0%

* Outside of the Lake Ontario Direct Drainage Basin



"Find your place on the planet. Dig in, and take responsibility from there." – Gary Snider



1. Major Population Centers and Municipal Governments

SOURCE: LOCI; US Census Bureau, 2000.

Population by Census Block Groups

Census Tracts

Census tracts are small and relatively permanent geographic subdivisions of a county. The primary purpose of census tracts is to provide a nationwide set of geographic units that have stable boundaries. Each census tract must have a reasonably compact and continuous land area, parts of which are internally accessible by road. The entire area and population of a county are covered by census tracts. Census tract boundaries should follow visible and identifiable features, such as roads, rivers, canals, railroads, and above-ground high-tension power lines.

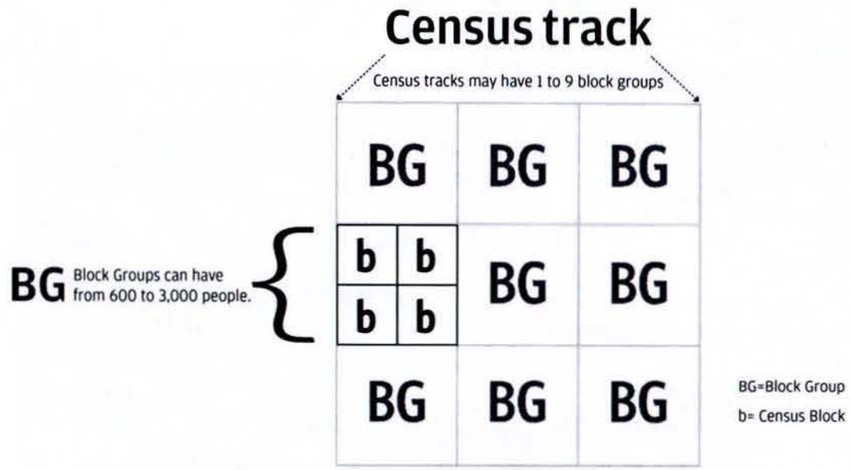
Census Block Groups

A block is the smallest geographic entity for which the Census Bureau tabulates decennial census data. Block groups are geographic subdivisions of census tracts; their primary purpose is to provide a geographic summary unit for census block data. A block group must comprise a reasonably compact and contiguous cluster of census blocks. Block group boundaries should follow visible and identifiable features, such as roads, rivers, canals, railroads, and above-ground high-tension power lines. Each census tract contains a minimum of one block group and may have a maximum of nine block groups. Block groups generally contain between 600 and 3,000 people, with an optimum size of 1,500 people.

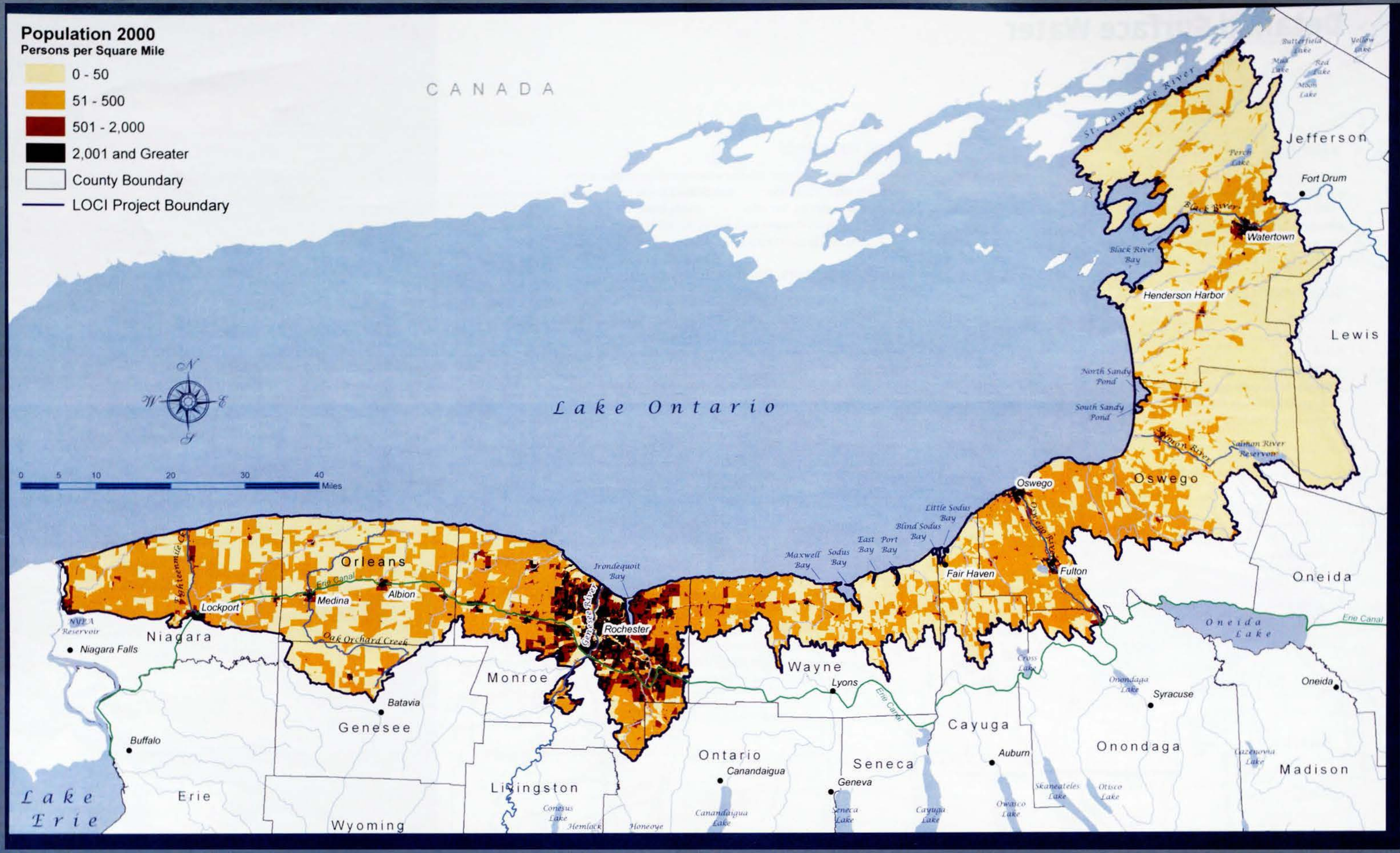
Population concentrations by block group are found on this map in the region's urban centers, particularly the greater Rochester (Monroe County) area. The major land cover/use of the LODDB is agriculture (52%) and forest (36%), which is represented by the low populations of most of the map areas.

Estimated Population Change

COUNTY	2000	2009 (estimated)	% change
Monroe	735,343	733,703	−0.2%
Onondaga	458,336	454,753	−0.8%
Niagara	219,846	214,557	−2.4%
Oswego	122,377	121,377	−0.8%
Jefferson	111,738	118,719	6.2%
Ontario	100,224	105,650	5.4%
Wayne	93,765	91,291	−2.6%
Cayuga	81,963	79,526	−3.0%
Genesee	60,370	57,868	−4.1%
Orleans	44,171	42,051	−4.8%
Lewis	26,944	26,157	−2.9%



"We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect." – Aldo Leopold



2. Population by Census Block Groups

SOURCE: LOCI; U.S. Census Bureau, 2000.

Detailed Surface Water

Water Flow

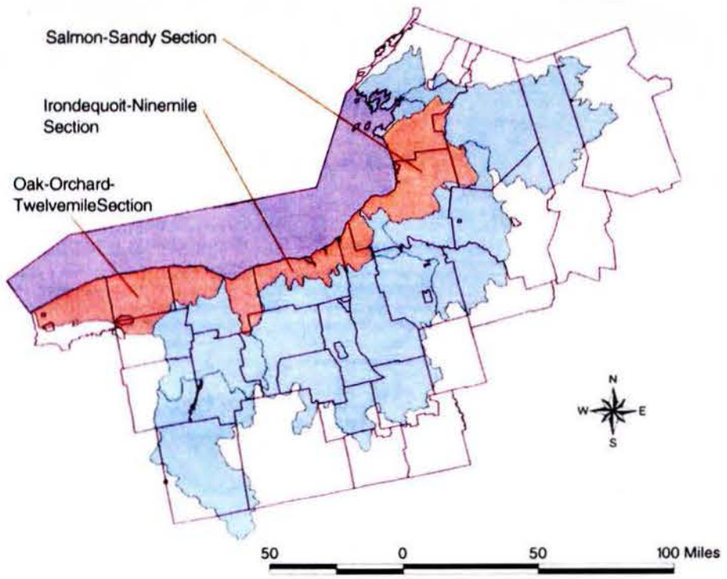
Water from over 13,600 square miles of New York State ultimately flows to Lake Ontario through a complex network of streams and rivers, lakes, ponds and wetlands.

The four major drainages to Lake Ontario are the Seneca-Oneida-Oswego Rivers basin, the Genesee River basin, the Black River basin, and the Direct Drainage basin, which is the concentration of this book. Lake Ontario is the smallest of the Great Lakes, but it has the highest ratio of watershed area to lake surface area.

Subwatersheds

The Lake Ontario Direct Drainage Basin (LODDB) is comprised of three major subwatersheds that drain directly to Lake Ontario, along 326 miles of shoreline. The areas from east to west contain the following:

Salmon-Sandy Drainage Area: Jefferson, Oswego, western Lewis Counties
Irondequoit-Ninemile Drainage Area: Cayuga, Wayne and part of Monroe County
Oak-Orchard Drainage Area: Part of Monroe, Orleans County and Niagara Counties
The three areas combined encompass 2,700 square miles.



Small Watersheds

The watercourses of the major tributary watersheds of lake Ontario include:
Salmon River: 639 river miles **Oak Orchard Creek:** 523 river miles
Irondequoit Creek: 316 river miles **Sandy Creek:** 303 river miles
A total of 5,891 miles of smaller watercourses like brooks and creeks flow through the direct drainage areas of the Lake Ontario Basin.

Freshwater Lakes, Ponds and Reservoirs

There are 60 significant freshwater lakes, ponds and reservoirs totaling 18,042 acres in the Lake Ontario basin. Among the significant water resource features in this basin are:
Irondequoit Bay: 1,720 acres **Sodus Bay:** 3,360 acres
Salmon River Reservoir: 3,380 acres **North Pond:** 2,400 acres
Perch Lake: 1,480 acres
Plus Salmon Creek, and some segments of the New York State Barge Canal

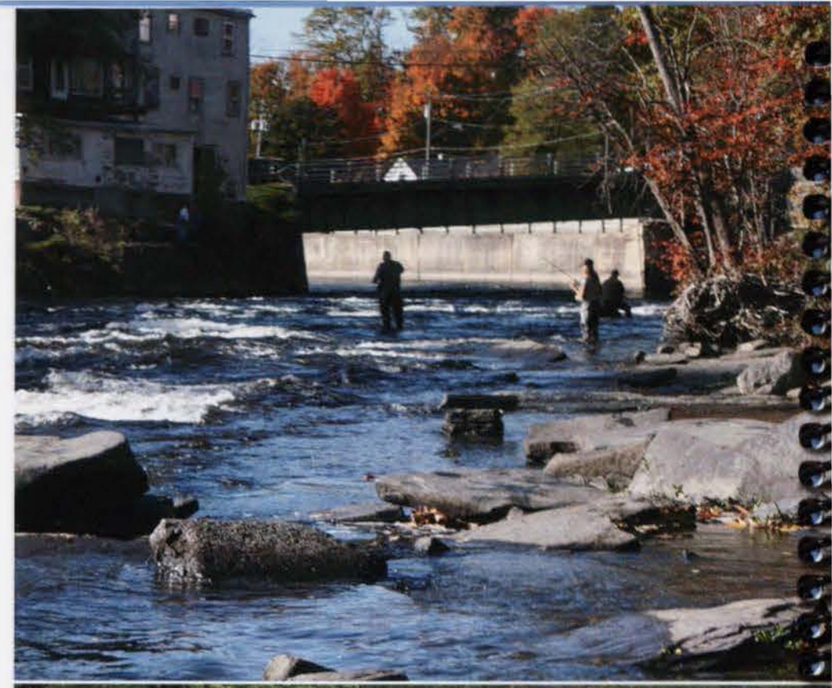
Hydrologic Unit Codes

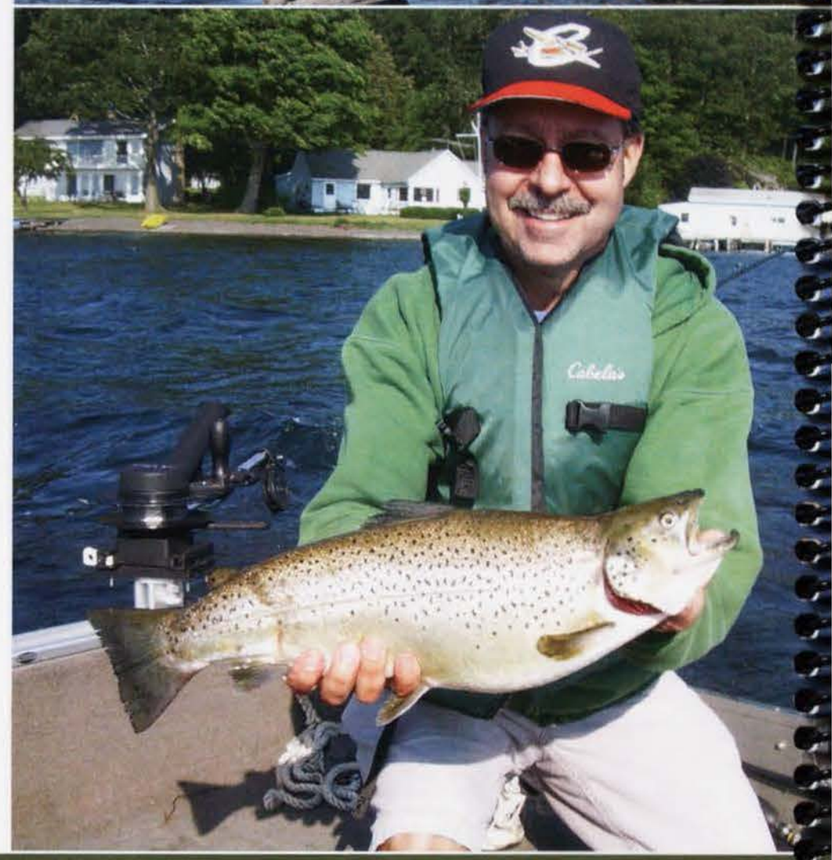
The US Geologic Survey (USGS) Hydrologic Unit codes (HUC) serve as a way to identify the boundaries of all watersheds that drain to a specific waterbody, such as a lake, pond, or stream. New York is delineated into these USGS HUC identifying all watersheds contributing to waterbodies within the State.

Water Quality

In the LODDB about 53% of river/stream miles, 66% of lake, pond, and reservoir acres, and 100% of Lake Ontario shore miles have been assessed by the New York State Department of Environmental Conservation. Water qualility in the LODDB is largely a reflection of water quality in Lake Ontario, including the nearshore waters and embayments. The legacy of toxic discharges to the Lake and its tributaries results in fish consumption advisories for numerous species. While phosphorus levels in the open lake have declined over the years, nutrients and resulting aquatic plant growth continue to impact recreational uses in nearshore waters.

Please refer to Map #9: Coastal Priority Waterbodies and Areas of Concern for more information regarding assessment and remediation in the LODDB.





"Water links us to our neighbor in a way more profound and complex than any other." – John Thorson

3. Detailed Surface Water

SOURCE: LOCI: Detailed Hydrology: New York State Department of Environmental Conservation, 2000: Large Scale Hydrology: U.S. Geological Survey, 1999: HUC Watershed Boundary: U. S. Department of Agriculture; Natural Resources Conservation Service, 2003.

Topography

Glacial History

The topography of the Lake Ontario Direct Drainage Basin (LODDB) reflects the glacial history of the Great Lakes. Approximately 13,000 years ago, at the end of the last ice age, Glacial Lake Iroquois was essentially an enlargement of the present-day Lake Ontario. The Lake formed because the St. Lawrence River downstream was blocked by the ice sheet near the present- day Thousand Islands. The water level at that time was approximately 100 ft above the present level of Lake Ontario. The old shoreline that was created during that time can be easily recognized by the beaches and wave-cut hills 10 to 25 miles (15 to 40 km) south of the present shoreline. This can be seen traveling east/west along State Route 104 along the Lake's eastern shore.

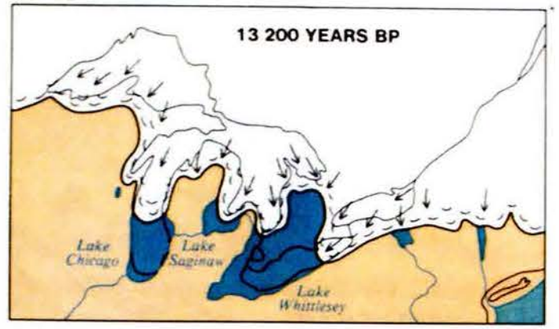
Glacial landform features such as moraines, drumlins, and eskers are found throughout the LODDB. Low-lying limestone headlands, bays, peninsulas, and islands extend from the St. Lawrence to the Pulaski area. Sandy beaches and marshes are south of Stony Point. The area from Pulaski to Rochester lies along the northern edge of the largest drumlin field in the United States. These glacier-molded hills lie on a north-south axis. Along Lake Ontario, particularly east of Oswego, the waves of the Lake have truncated these hills, leaving a series of high shore bluffs alternating with bays, streams, ponds, or marshes.

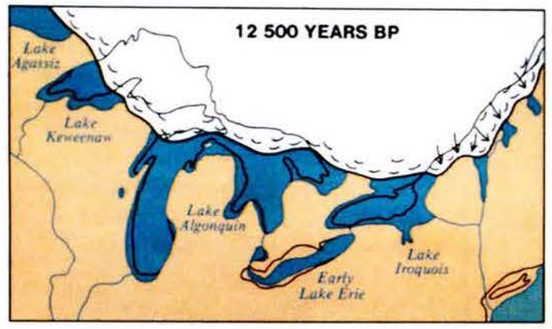
Ecoregions

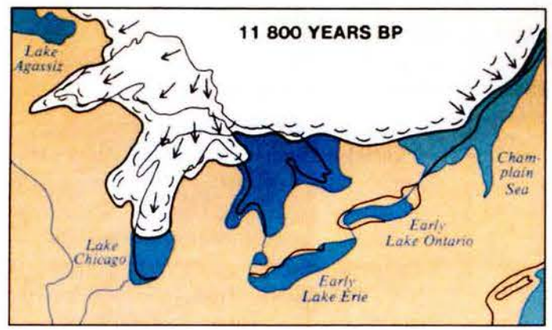
The Lake Ontario Basin encompasses three distinct ecoregions, defined as areas of broad ecological unity based on characteristics such as topography, geology, plant and animal communities, climate, and hydrology. Most of the LODDB is found in the Lake Erie and Lake Ontario Lake Plain ecoregions, with a small eastern area overlapping the Adirondack Mountain and Foothills ecoregion. The western area falls completely in the Lake Erie and Lake Ontario Lake Plain and the central area is split between the Eastern Ontario Till Plain and the Lake Erie Plain. The eastern section includes this Lake Erie Plain, some Black River Valley and the Tug Hill Plateau and Transition.

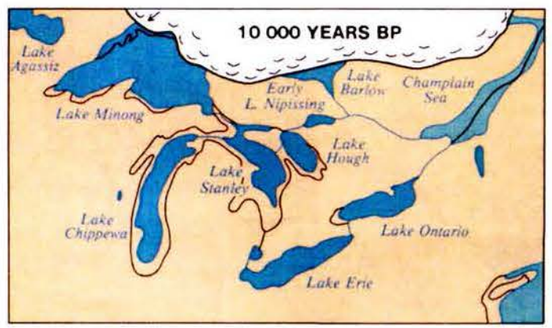
Climate and Topography

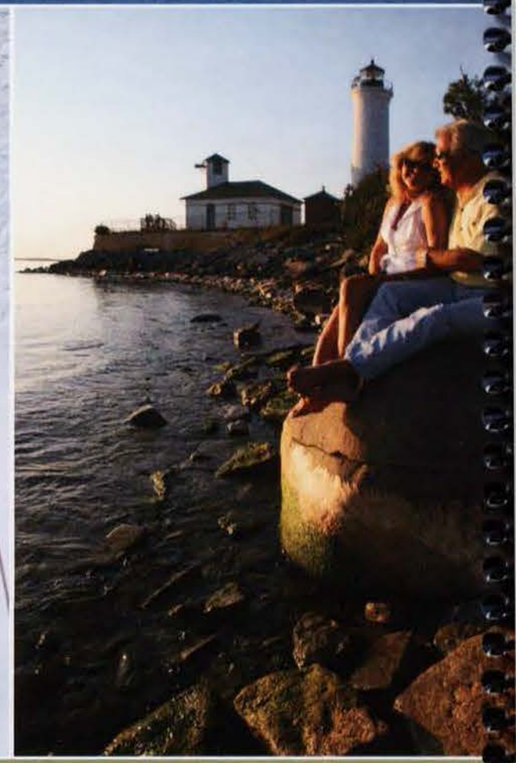
Topography has a great influence on the climate of the LODDB. For example, the region from Rochester to the Niagara River is characterized by the post-glacier lakebed topography. The land, rising gently back from the Lake, is affected by the moderating influence of the Lake on the region's climate. Consequently, this is one of the great orchard regions of the eastern United States. Conversely, the Tug Hill Plateau is an area of elevated land that is about 20 mi. /32 km. to the east of Lake Ontario. Tug Hill's elevation, along with ample moisture from the lake, creates ideal conditions for snowfall. The "Hill", or the "Tug", as it is often referred to, typically receives more snow than any other region in the eastern United States.











"Those who contemplate the beauty of the Earth find resources of strength that will endure as long as life lasts." – Rachel Carson

4. Topography

SOURCE: LOCI; USGS Digital Elevation Model (DEM), 1992.

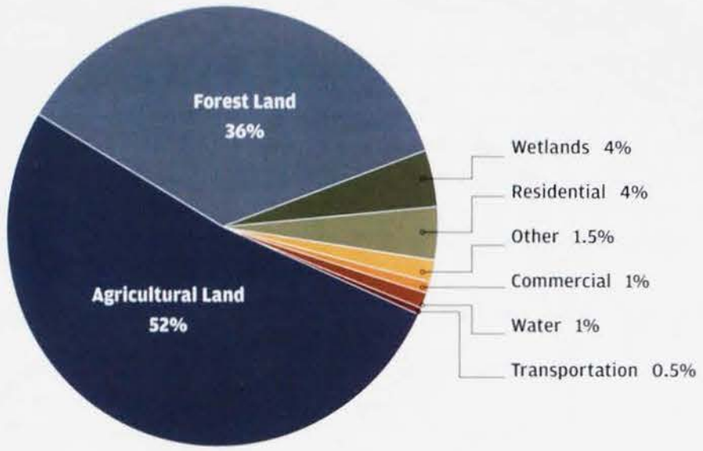
Land Use Types

Major Land Use Types in the LODDB:

Although the peripheral upland areas of the basin are forested, closer to the Lake the climate and soil types support various agricultural activities. Agricultural land is used for row crops, orchards, vineyards, pasture, and hay fields. Areas such as the Niagara region are highly specialized for growing fruits and vegetables. Barren land, which is represented on the map, is an area with less than one third of vegetation or other cover.

In the eastern section of the LODDB, dairy farming dominates the Tug Hill Plateau. The forest cover is primarily deciduous forest, with some mixed hardwood, conifer and pure conifer stands. Wetlands, especially freshwater emergent marshes, are also a major feature of this section. In Oswego County, wetlands comprise as much as 20% of the land area.

The Great Lakes Basin is a key area for muckland in the United States. Muck is a deep, rich, black soil that is high in nutrients. It is mainly used for vegetable production, especially for onions. Muck soil develops from wetlands that dried out a very long time ago. It takes nature about 500 years to accumulate one foot of muck soil. The counties in the LODDB that have muck soils are Orleans, Genesee, Oswego, Cayuga and Onondaga.



Cultural and Natural Resources

The many significant cultural and natural resources in the LODDB are geographically dispersed along the Lake Ontario shoreline and find their regional identity in association with the Great Lakes Seaway Trail tourism route. This route parallels the St. Lawrence River, Lake Ontario, Niagara River and Lake Erie shorelines in New York and Pennsylvania.

The Niagara River bounds the western edge of the LODDB with nearby Youngstown and Old Fort Niagara State Park on Lake Ontario. Along the Lakeshore, Wilson, Olcott, Waterport, Childs, Ontario, Williamson, Sodus Point, Sterling, Henderson, Henderson Harbor, Brownville, and Three Mile Bay are the cultural and population centers of mainly rural watersheds. Watertown and the Tug Hill Plateau are along the most eastern area of the LODDB.

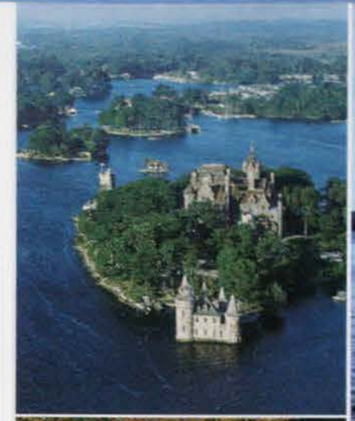
Revenue from tourism is a major economic factor for these communities, so it is vital that the natural resources be maintained and restored.

The largest urban area with the highest population density is surrounding the City of Rochester in Monroe County. In addition to the Lake, related cultural and natural resources that attract travelers to the Lake region include 13 historic lighthouses, Chimney Bluffs, shoreline parks and trails, coastal vineyards, farm markets, two forts, two castles and a War of 1812 Battlefield.

Fun Activities

The LODDB provides for water-based recreation such as boating and fishing. Lake Ontario is a favorite destination for anglers in search of trout, salmon, bass, walleye, and panfish. Other recreational activities include trout and steelhead fishing along the creeks and rivers; automobile stops and walking along the Erie Canal; and passive recreation such as bird watching and sightseeing throughout the area.

The Great Lakes Seaway Trail is one of America's Byways and a National Recreation Trail recognized for its unique landscape, scenic freshwater coastline, and historical significance. Forests, fields, wetlands, sand dunes and other natural attractions can be enjoyed at more than 120 sites. This National Scenic Byway offers 518 miles of leisure travel opportunities. Learn more at www.seawaytrail.com.



"Just as we must carefully plan for and invest our capital in infrastructure – our roads, our bridges, and water lines - we must also invest in our environment, our green infrastructure – our forest, our wetlands, our streams and rivers." – Parris Glendening, Former Governor of Maryland

5. Land Use Types

SOURCE: LOCI - USGS National Land Cover Dataset, 1992.

Wastewater Treatment Plants

Clean Water Act

In 1972, in recognition of the nation's interest in protecting its vast waters, Congress enacted the Clean Water Act (CWA), which instituted strict regulatory requirements as the cornerstone of surface water quality protection measures in the US.

National and State Systems

The National Pollutant Discharge Elimination System (NPDES) was developed for implementing the requirements for all discharges to surface waters of the United States. Under New York State law, the program known as the **State Pollutant Discharge Elimination System** (SPDES) was developed and is administered by the New York State Department of Environmental Conservation.

SPDES is broader in scope than the Clean Water Act in that it controls point source discharges to groundwaters as well as surface waters. A fundamental aspect of the SPDES program is that each wastewater discharger must obtain a permit that limits the amount of pollutants that can be discharged into a waterbody. The treated wastewater is released into local waterways where it's used again for any number of purposes, such as supplying drinking water, irrigating crops, and sustaining aquatic life.

Purification Processes

Wastewater treatment is one of the most common forms of pollution control to protect our waters. Its basic function is to speed up the natural purification process. Wastewater from homes, along with wastewater from businesses, industries, and other facilities, flows through a community's sanitary sewer system to a wastewater treatment plant.

Wastewater treatment stages

Primary treatment: Solids are allowed to settle and are then removed from wastewater.

Secondary treatment: Designed to substantially degrade the biological content of the sewage, which is derived from human waste, food waste, soaps, and detergent. The majority of municipal plants treat the settled sewage liquor using aerobic biological processes.

Tertiary treatment: Provides a final treatment stage to raise the effluent quality before it is discharged to the sea, river, lake, ground, etc. More than one tertiary treatment process, such as lagooning, filtration, constructed wetlands, and nutrient removal, may be used at any treatment plant.

Negative Water Quality

Nonpoint sources of pollution, such as failing septic systems, are a major concern in nonsewered areas, where wastewater generated is treated by individual on-site systems. Failing or inadequate on-site septic systems and other untreated sanitary discharges to waters account for a large percentage of negative water quality impacts.

In addition to the impact on recreational use and aquatic life support, such conditions also raise public health concerns as well. County programs are in place, such as septic system management programs in Cayuga County, which require the inspection and pumping of septic tanks over a period of time to check if they are in good condition and working properly.

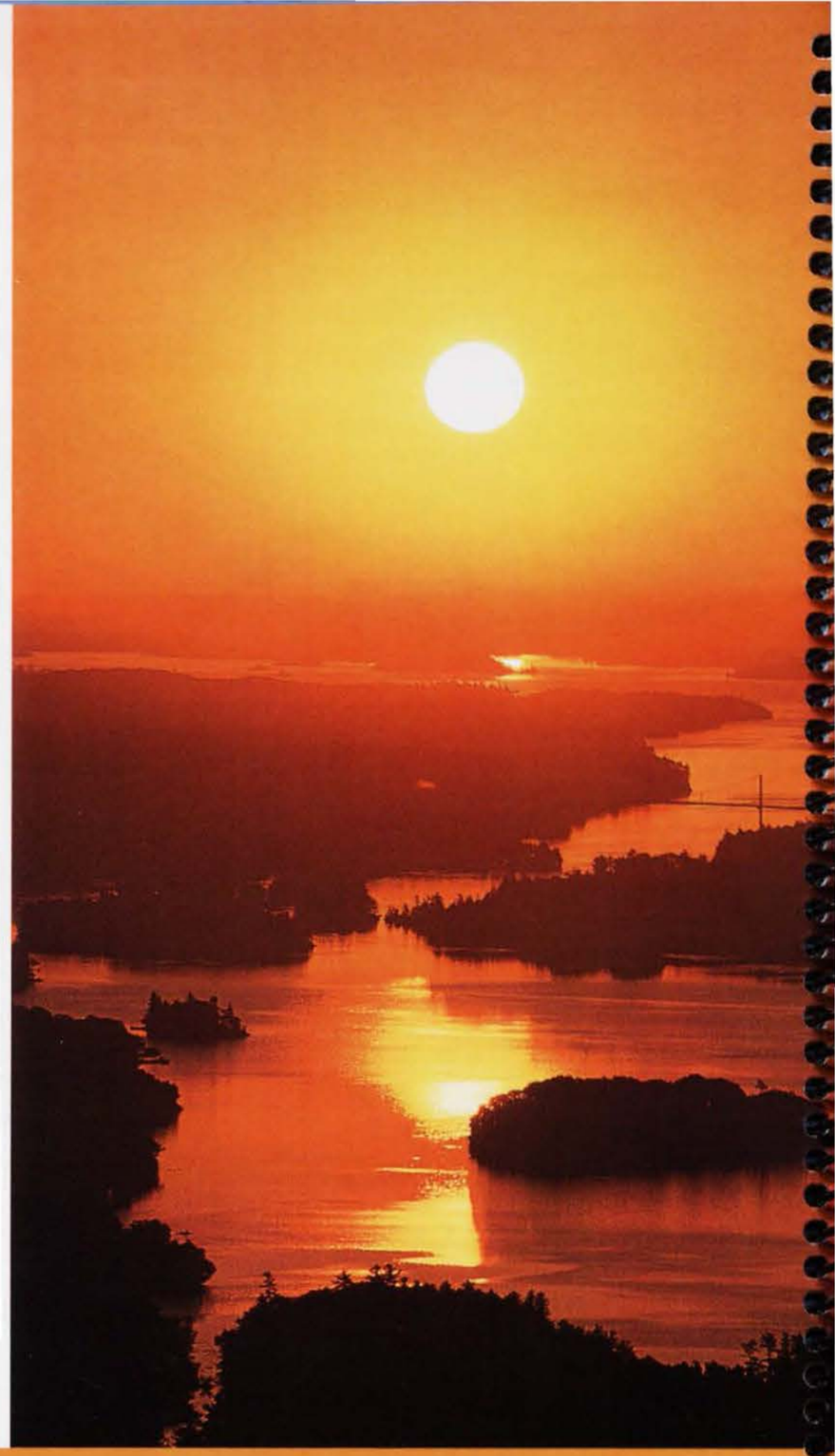
Model septic system ordinances have been adopted by towns in Wayne County to combat these problems that negatively effect water quality.

Costs of Having Clean Water

Wastewater treatment systems are essential for the protection of our waterbodies. Many factors that have caused the cost of New York State's wastewater infrastructure to increase. New federal standards push the need for enhanced wastewater treatment systems, as well as the sometimes costly programs to address stormwater, combined sewer overflows (CSOs), and separate sanitary overflows.

Many facilities are past their expected useful lives. Systems are failing, and municipalities do not have the funds to adequately repair and replace necessary infrastructure. The conservative cost estimate of repairing, replacing, and updating New York's municipal wastewater infrastructure is $36.2 billion over the next 20 years (NY State Department of Environmental Conservation, 2008 report). This is more than local governments and the State can address on their own. Federal, state and local governments will need to establish stronger partnerships toward a long-term solution.

The Lake Ontario Direct Drainage Basin is very fortunate to have vast water resources. These resources are critical to the people who rely on them for drinking, bathing, recreation, and to all living things. Undertreated or raw sewage, street waste, and nutrient pollution cause excess algae and weed growth. This impairs the precious waters of Lake Ontario. A reliable and efficient wastewater treatment system protects the Lake and waterbodies, and also contributes to the health of the regional communities and the future of economic growth.



"No one has the right to use America's rivers and America's Waterways, that belong to all the people, as a sewer. The banks of a river may belong to one man or one industry or one State, but the waters which flow between the banks should belong to all the people." – Lyndon B. Johnson, signing the Clean Water Act of 1965.

6. Wastewater Treatment Plants

SOURCE: LOCI, Waste Water Treatment Facilities, US EPA Region 2, 2004.

Public Lands

The coastal region of Lake Ontario has a wealth of natural resources and scenic beauty. County and municipal parks are scattered throughout the LODDB. In Monroe County alone nearly 12,000 acres have been set aside in 21 parks for the public to explore and enjoy. Residents and visitors are provided with many opportunities to picnic, camp, bicycle, fish, swim, or just relax and observe nature. Maps and more information about many of the sites listed on this map can be found at the Department of Environmental Conservation's website.

Wildlife Viewing Areas

There are several wildlife viewing areas along the coast of Lake Ontario. These areas, which are accessible year-round, provide an opportunity for the public to observe wildlife in their natural habitat. Many of these areas have visitor centers, interpretive walking trails, nature workshops, and Watchable Wildlife events. To see a full list of wildlife viewing sites, or to find information about Watchable Wildlife events, please visit the NYSDEC website.

New York State Bird Conservation Area

The New York State Bird Conservation Area Program was established in 1997 to safeguard and enhance bird populations and their habitats on State lands and waters. An area can be designated as a Bird Conservation Area if it is judged an important-enough site for one or more species. A site is nominated because of its importance to large numbers of waterfowl, pelagic seabirds, shorebirds, wading birds, and migratory birds. A site can also be nominated because of high species diversity, importance to species at risk, or its importance as a bird research site.

There are several of these sites in the LODDB, which is an important flyway for migratory birds, including:

- **Braddock Bay**
- **Lakeview Marsh**
- **Perch Lake**
- **Derby Hill Bird Conservation**
- **The Iroquois National Wildlife Refuge**
- **Little Galloo Island**
- **Ashland Wildlife Management Area**
- **Black Pond Wildlife Management Area**

New York State Marine Facilities

New York State Marine Facilities provide public access for boat launching, or to fish from shore. Marine parks that provide facilities in the LODDB include: Oak Orchard, Irondequoit Bay, and Chaumont.

The New York State Department of Environmental Conservation provides an online Marine Public Access page, which lists contact information for the parks, agencies, and municipalities that manage the facilities for public use.

Wetlands

Numerous wetlands are scattered throughout the LODDB. These areas provide important habitat for resident and migratory birds, as well as other wildlife species. They also play an important role for:

- **Flood and storm water control**
- **Erosion control**
- **Nutrient cycling**
- **Surface and groundwater protection**
- **Pollution treatment**

The New York State Freshwater Wetlands Act, passed in 1975, protects and preserves these valuable areas. The Act requires the DEC to map all those wetlands protected by the Act so that affected landowners can be notified, and for other interested parties to know where jurisdictional wetlands exist. The National Fish and Wildlife Service is also required to map wetlands in all of the states through the National Wetlands Inventory (NWI) and to assess the status of the nation's wetland resources every ten years. This report helps the State to understand the extent of its wetlands and ensure that all wetlands are being used properly, and protected against the negative impacts of development.

State Forests

State Forests are under the administration of the New York State Department of Environmental Conservation's Division of Lands and Forests. These are forested areas which have been acquired by people of New York State outside the Adirondack and Catskill Parks. State Forests include:

- **Reforestation Areas**
- **Unique Areas**
- **Multiple-Use Areas**
- **State Nature Preserves**
- **Historic Preserves**

Coastal Areas

The Eastern Lake Ontario Dune and Wetlands system is a barrier-beach formation that stretches for 17 miles along the eastern shore of Lake Ontario from the Salmon River north to Stony Point. It is the only freshwater barrier-beach formation in New York, and is an important staging area for migratory birds and other unique species. The area is comprised of two state parks, three wildlife management areas (WMAs), one State Forest property, and the Eldorado Preserve owned by The Nature Conservancy. The New York State Department of State and other agencies and organizations have partnered to guide the conservation and beneficial use of the Eastern Lake Ontario Dune and Wetlands System. Special planning and management initiatives are described in the document, *"New York's Eastern Lake Ontario Dune and Wetland System: Guidelines for Resource Management in the 21stCentury."*

State Parks

New York's State Parks offer countless opportunities to explore the natural environment, escape from the grind of the everyday, and experience exciting new adventures. Beaches, boat launches, hiking trails, campsites, and golf courses found throughout the LODDB are enjoyed by residents and tourists alike.

Wildlife Management Areas

Wildlife Management Areas (WMAs) are lands owned by New York State under the control and management of the Department of Environmental Conservation's Division of Fish, Wildlife and Marine Resources. These lands have been acquired primarily for the production and use of wildlife. While fishing, hunting, and trapping are the most widely practiced activities on many WMAs, they are not limited to these activities. Most WMAs also provide good opportunities for hiking, cross-country skiing, bird watching, or just enjoying nature.

Reaching from the mouth of the Salmon River north to the outlet of Black Pond, the Eastern Lake Ontario Dune and Wetlands Area contains three WMAs: Deer Creek WMA, Lakeview Marsh WMA, and Black Pond WMA. Because of a barrier environment of beaches, sand dunes (some cresting at more than 70 feet above the surface of the lake), embayments, and wetlands, these areas contain rare plants, animals, and natural communities restricted to this type of shoreline area.

These habitats would be quickly destroyed if the barrier were eroded and lost. Braddock Bay, which covers 2,402 acres in Monroe County, is another of more than 21 WMAs in the LODDB. Please visit the NYSDEC website for a complete listing of WMAs by county in the LODDB.

National Wildlife Refuge System

The mission of the National Wildlife Refuge System is to manage a national network of lands and waters for the conservation, management, and, where appropriate, restoration of fish, wildlife, and plant resources and their habitat for the benefit of present and future generations of Americans. The Iroquois National Wildlife Refuge lies midway between Buffalo and Rochester, and is the only National Wildlife Refuge in the LODDB. It is within the Atlantic Flyway, a primary migration route for many bird species. The area encompasses 10,818 acres of habitat, with freshwater marshes, hardwood swamps, forests, meadows, and fields.

"Thousands of tired, nerve-shaken, over-civilized people are beginning to find out that going to the mountain is going home; that wildness is a necessity; that mountain parks and reservations are useful not only as fountains of timber and irrigating rivers, but as fountains of life. – John Muir

7. Public Lands

SOURCE: LOCI: NWI Wetlands: U.S. Fish and Wildlife Service; DEC Wetlands: NYS DEC; Park Boundaries: NYS Office of Parks, Recreation and Historic Preservation; NYSDOS Coastal Habitat Areas: NYS Department of State; Division of Coastal Resources; Wildlife Management Areas: Habitat Inventory Unit Department of Environmental Conservation, 2004; NYS Marine Facilities: NYS Office of Parks, Recreation and Historic Preservation; Bird Concentration Areas: Habitat Inventory Unit of the Division of Fish, Wildlife and Marine Resources; The New York Wildlife Viewing Guide; published by Falcon Publishing, Inc., 1998; Viewable Wildlife Locations: Habitat Inventory Unit, 1998; State Forests: NYSDEC Bureau of State Land Management Division of Lands and Forests, 2005.

Status of Municipal Land Use Controls

Planning and Zoning

Planning and zoning have long been a part of the social and political landscape of the state of New York at all levels of government. The state constitutional provisions for home rule specify that cities, towns, and villages are the primary authority for guiding community planning and development. Local governments' efforts to manage the development of land within the community previously centered on public health, safety, and welfare.

Access to clean water is just one attribute that provides a strong incentive to the citizens and elected officials of cities, towns, and villages in the state to regulate land uses. Areas that do not have controls over land use have little leverage, outside of enacting an emergency moratorium, when trying to control unwanted and unanticipated land use projects that may appear.

Local governments often turn for technical assistance to county and regional planning agencies and municipal associations, including:

- **The New York Planning Federation**
- **The NYS Department of State's Division of Local Government Services**
- **Department of Environmental Conservation**
- **Department of Agriculture and Markets.**

Resource-based and region-based planning have been the foundation of most federal and state planning initiatives.

Comprehensive Plans

A majority of the municipalities in the Lake Ontario Direct Drainage Basin have adopted Comprehensive Plans. These plans describe the community's existing conditions and identify future goals for growth, economic development and conservation. The comprehensive plans also serve as a tool to help guide both county and local decision makers when considering planning and development matters.

Legislation sponsored by the Rural Resources Commission (Chapter 418, Laws of 1995) created the first statutory definition of municipal comprehensive plans in New York. Such written plans are easily identifiable and accessible to the public and provide legitimacy to local zoning and land use decisions, particularly when these decisions are challenged in court. Similarly, the State Land Use Advisory Committee and Rural Resources Commission drafted comprehensive plan legislation for counties and regional planning councils that became law in 1997. Ready access to such county plans is of particular importance to county planners when they review local planning and zoning actions under Article 239-L and M of the General Municipal Law. It is also important to the development and implementation of county and town agricultural and farmland protection plans.

Zoning Regulations

Municipal zoning regulations are a major tool for guiding land use decisions in New York and the Lake Ontario Direct Drainage Basin. Zoning helps to separate compatible and incompatible uses, thereby protecting property values and promoting economic growth, public health, safety, and welfare. In New York, the statutes provide that zoning regulations "shall be made in accordance with a comprehensive plan ... ."

Over time, the courts have sanctioned zoning ordinances, even though they were not based on a formal written comprehensive plan.

Overlay Zone

Although it is not indicated on the map next page, a water protection overlay zone is a special kind of zoning district designed to protect a stream corridor, lake, or watershed. It "overlays" existing zoning districts and adds additional requirements to the underlying district zoning, which remains in effect except to the extent the overlay zone provisions specifically modify it.

An overlay zone protects water quality by setting additional standards for development by incorporating site-specific review procedures. By creating a system of "overlay zones" that cross conventional zoning district boundaries and protect stream corridors, lakeshores, and watersheds, it is possible to maintain and improve water quality even as the community becomes more developed. This type of zoning is especially important to protect the water resources in the Lake Ontario Direct Drainage Basin.

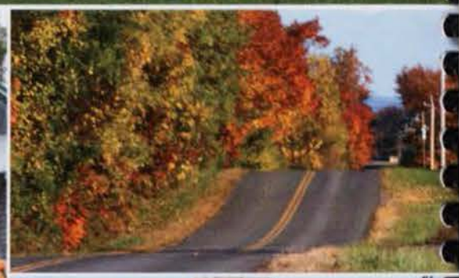
Subdivision Regulations

Unlike zoning, subdivision regulations deal exclusively with new residential development as land is divided into lots and streets on which homes are to be built and provided with appropriate infrastructure. Subdivision regulations significantly affect infrastructure, public health and safety, housing affordability, and open space. The review and approval of the subdivision of land ensures the provisions of comprehensive plans and zoning laws are followed.

Site Plan Review

Whereas subdivision regulations deal with the division of land into buildable lots, zoning deals with the outside dimensions of lots and allowable land uses, site plan review deals with the structure and its use on the lot. Many municipalities employ a site plan review to insure building projects conform to comprehensive plan objectives.

In metropolitan areas, site plan review is most commonly applied to large-scale commercial or residential development such as shopping malls, superstores, and large subdivisions. Some rural communities start with the site plan review process as opposed to adopting zoning or subdivision regulations. This is especially the case in those rural areas where subdivision activity is minimal and zoning is unwelcome by property rights advocates. Some communities regard site plan review as a function of their planning board. Others, which may have placed their site plan review regulations within the zoning ordinance or local law, assign the task to their zoning board of appeals.



"Sprawl is America's most lethal disease." – Robert Frielich

LOCI Project Boundary

Town Boundary

New York State Land Use Controls

- No Controls
- Zoning
- Zoning, Site Plan Review
- Zoning, Subdivision Regulations
- Zoning, Subdivision Regulations, Site Plan Review
- Subdivision Regulations, Site Plan Review
- Comprehensive Plan
- Comprehensive Plan, Zoning
- Comprehensive Plan, Subdivision Regulations
- Comprehensive Plan, Zoning, Site Plan Review
- Comprehensive Plan, Subdivision Regulations, Site Plan Review
- Comprehensive Plan, Zoning, Subdivision Regulations
- Comprehensive Plan, Zoning, Subdivision Regulations, Site Plan Review

CANADA

Lake Ontario

Lake Erie

0 5 10 20 30 40 Miles

Niagara Falls, Buffalo, Lockport, Medina, Albion, Batavia, Rochester, Fair Haven, Oswego, Fort Drum, Watertown, Henderson Harbor, Lyons, Canandaigua, Geneva, Auburn, Syracuse, Oneida, Fulton

Niagara, Erie, Genesee, Orleans, Monroe, Wyoming, Livingston, Ontario, Wayne, Seneca, Cayuga, Onondaga, Oswego, Jefferson, Lewis, Oneida, Madison

8. Status of Municipal Land Use Controls

SOURCE: LOCI: Published by NYS Legislative Commission on Rural Resources. Appendix A: Directory of Basic Land Use Tools Used by Each City, Town, and Village in NYS 2003 Update.

Coastal Priority Waterbodies and Areas of Concern

Priority Waterbodies List

In order to fulfill certain requirements of the Federal Clean Water Act, the New York State Department of Environmental Conservation (NYSDEC) must provide regular, periodic assessments of the quality of the water resources in the state. This inventory of water quality information is the Division's Waterbody Inventory/Priority Waterbodies List (WI/PWL).

ThemostrecentLakeOntarioandMinorTributariesBasinWaterbodyInventory/PriorityWaterbodies List Report was issued as a Final Draft Report in August 2007. This report includes an overall evaluation of water quality in the Lake Ontario Direct Drainage Basin (LODDB), as well as assessments for specific waterbody segments in the basin. To view the report please visit the NYS DEC website.

Stressed or Impaired Waters

About one-third (36% or 2,100 miles/3,380 km) of the river miles in the LODDB are included on the Priority Waterbodies List as either not supporting uses or having minor impacts or threats to water quality. The large majority (78% or 4,500 miles/7,242 km) of these river miles are considered Stressed or Threatened Waters that fully support appropriate uses, but that have minor impacts/threats to uses. Only about eight percent (8%) of basin river miles are Impaired and do not fully support appropriate uses.

Eighteen of the 60 separate lake segments in the basin are also included on the PWL as having impaired uses or minor impacts/threats to uses. However, these 18 impaired/impacted lakes represent two-thirds (66%) of the total lake acres in the basin. For ten of these lakes (totaling 7,759 acres, or 43% of the basin) the impacts are such that fish consumption, recreational uses and/or aquatic life are not fully supported. All of the 326 miles/525 km (100%) of Great Lake shoreline in the basin is assessed as being impaired and not supporting uses due to the fish consumption advisory for Lake Ontario. This advisory is the result of organics/pesticides contamination of lake sediments related to past/historic industrial discharges to the lake, the Niagara River, and the Upper Great Lakes.

In the LODDB, virtually 100% of the use impairment to lakes and bays is from failing on-site septic systems. These lakes and bays are rimmed with residential development.

On the other hand, the PWL indicates impairment to stream and river miles is caused by agriculture (66%), followed by failing septic systems (22%), land disposal (7%), and contaminated sediments (2%). In both lakes and rivers, nutrients are the primary pollutant with some impairment due to pathogens.

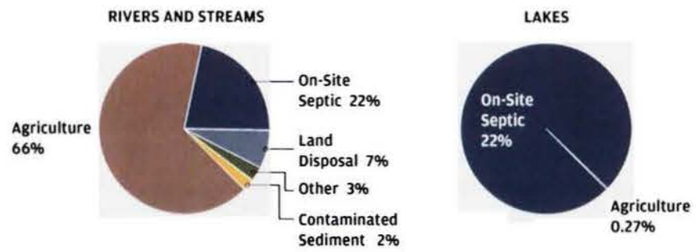
Areas of Concern

Other water quality issues center around Areas of Concern (AOCs), which are identified by the International Joint Commission (please see map key). These are being addressed through Remedial Action Plans (RAPs), and the Lake Ontario Lakewide Management Plan (LaMP), which is a multi-jurisdictional water quality restoration and protection effort.

Past industrial discharges are being remediated in AOCs in Oswego, Rochester, and Eighteenmile Creek. The designation as an AOC results in the development of a Remedial Action Plan (RAP) to address water quality issues and restore uses. Eighteenmile Creek was designated as an AOC in 1985 because of water quality and bottom sediment problems associated with past industrial and municipal discharge practices, the disposal of waste, and the use of pesticides. The Niagara County Soil and Water Conservation District took responsibility for coordination of the Eighteenmile Creek RAP in 2005.

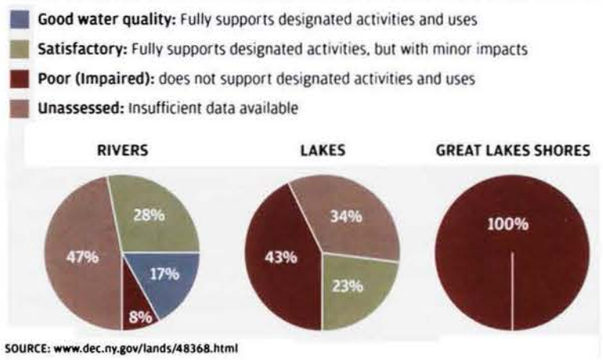
In July of 2006 Oswego Harbor was officially removed from the list of Great Lakes AOCs. The harbor is the first and only one of 31 Areas of Concern in the United States to be delisted. Pollution reduction activities in the Oswego Remedial Action Plan (RAP) to date that led to the delisting include: remediation of State Superfund hazardous waste sites, upgrade of the Oswego WWTP and collection system, control of point and nonpoint water discharges, reduction of nutrients and stormwater runoff, implementation of river corridor enhancement projects, and the Federal Energy Regulatory Commission's (FERC) re-licensing of the Oswego River power dam license to increase and better support the suitable fish habitat in the AOC.

Primary Causes of use impairment in the Direct Drainage Areas:

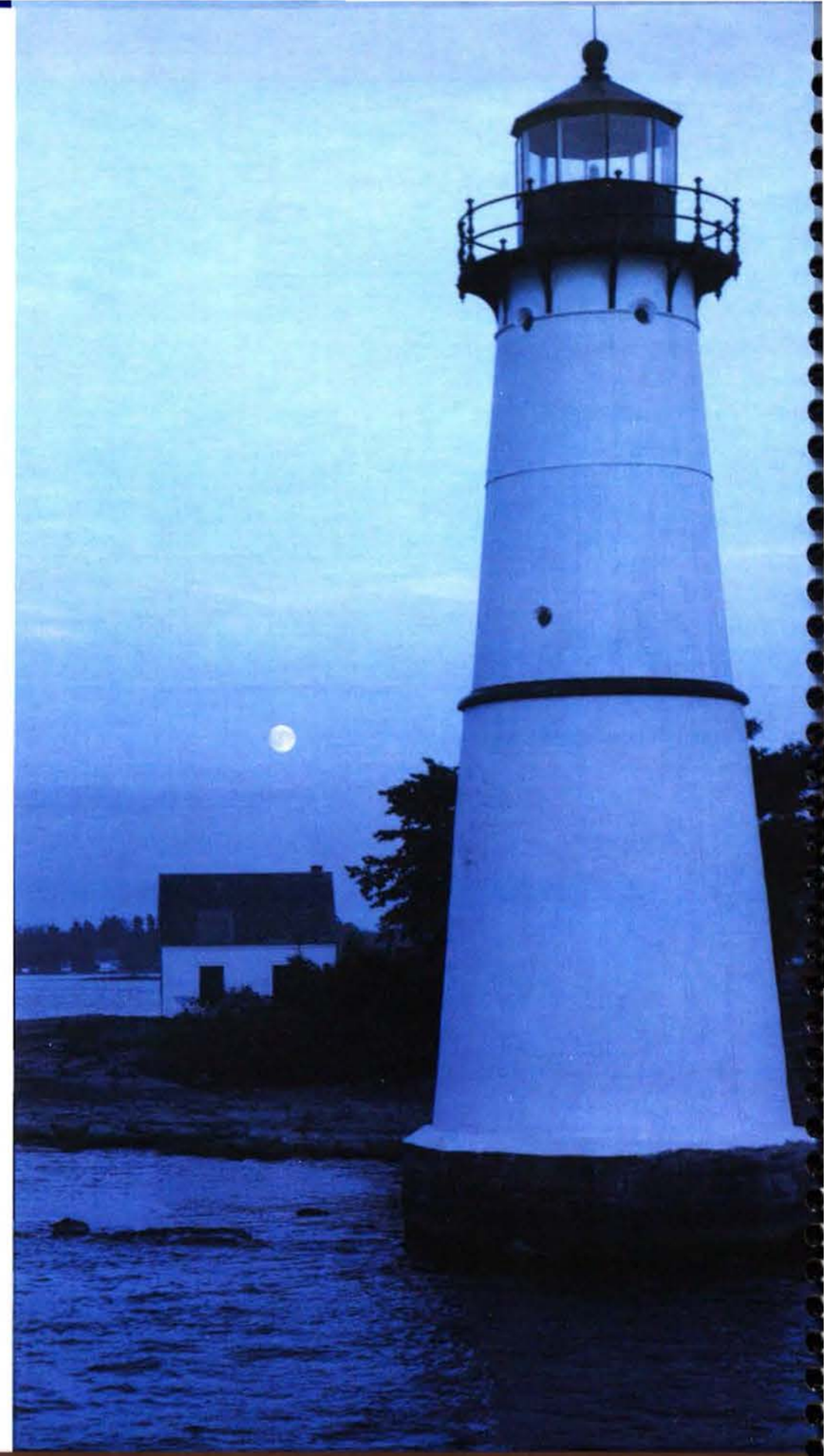


SOURCE: www.fllowpa.org/statebasin.pdf

Water Quality in The Lake Ontario and Minor Tributaries Watershed



SOURCE: www.dec.ny.gov/lands/48368.html



"Plans to protect air and water, wilderness and wildlife are in fact plans to protect man." – Stuart Udall

Explanation of Terms:

1. Areas of Concern (AOCs) are designated by the International Joint Commission and are areas where serious impairment of beneficial uses of water or biota (swimming, fishing, drinking, navigation, etc.) is known to exist, or where environmental quality criteria are exceeded to the point that such impairment is likely.

2. The Federal Clean Water Act requires states to periodically assess and report of the quality of their waters. Under Section 303(d) of the Act, New York State DEC identifies Impaired Waters where specific designated uses are not fully supported. NYS's 303(d) list includes those impaired waters where development of a Total Maximum Daily Load (TMDL) or comparable pollutant control strategy is required. TMDLs prescribe reductions of pollutant(s) that restrict the uses of the waterbody. For some 303(d) listed waterbodies, more documentation of impairments or pollutants is indicated prior to development of TMDLs.

3. Under Section 305(b) of the Clean Water Act, New York State maintains the Priority Waterbodies List (PWL), a subset of the statewide assessment of all waters called the Waterbody Inventory (WI). The 305(b) list includes all waterbodies with documented water quality problems. This map shows 305(b) waters classified as impaired which are not already on the 303(d) list.

4. Counties document local water quality priorities in their respective county water quality strategies. This map shows those local priorities which are not classified as impaired on the NYS 303(d) or 305(b) lists. Several of these waters are also documented by NYS as having minor impacts or needing verification of problems.

9. Coastal Priority Waterbodies and Areas of Concern

SOURCE: LOCI; NYS DEC Final 2004 Section 305(b); Priority Water Bodies List; County Agencies; Areas of Concern: US EPA, 1994.

Industrial and Municipal Permitted Discharges and Drinking Water Intake Locations

Water Uses

Municipalities, manufacturing, and power plants throughout the Lake Ontario Direct Drainage Basin draw 6,628 million cubic meters of water per year from Lake Ontario to satisfy water supply needs. Public water supply systems provide water to homes, schools, and offices, as well as industrial facilities and businesses. The average household uses 100 gallons of water per person per day. In addition, millions of people in both rural and urban areas rely on groundwater for their sole supply of water. Groundwater is important to the ecosystem, serving as a reservoir that replenishes Lake Ontario in the form of base flow in tributaries.

The region's large industrialized urban areas are located on the shores of Lake Ontario, not only because of transportation advantages but because of the inexhaustible supply of freshwater for domestic and industrial use. Many industries demand large quantities of water in their manufacturing operations. About 10 percent of the water used in industrial processes is consumed, with the remainder returned to the watershed following treatment.

Keeping Waters Clean

The following sites detailed on this map on the next page indicate the efforts made to keep the waters of Lake Ontario and surrounding drainage areas clean:

National Priorities List: The National Priorities List (NPL) is the Environmental Protection Agency's (EPA) list of hazardous waste sites potentially posing the greatest long-term threat to health and the environment. EPA identifies and ranks NPL sites according to threats to humans through actual or potential contamination of groundwater, surface water, or air.

Federal Superfund: The federal government's program to clean up hazardous waste sites. A Superfund site is an uncontrolled or abandoned place where hazardous waste is located, possibly affecting local ecosystems or people. Once discovered, sites are entered into the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), EPA's computerized inventory of potential hazardous substance release sites. The CERCLIS Database contains general information on sites across the nation and U.S. territories, including location, contaminants, and cleanup actions taken. The Superfund measures its cleanup accomplishments through various criteria, including construction and post construction completions of hazardous waste sites.

Permit Compliance System: The Permit Compliance System (PCS) provides information on companies which have been issued permits to discharge waste water into rivers. Information can be reviewed on when a permit was issued and expires, how much the company is permitted to discharge, and the actual monitoring data showing what the company has discharged. Inspection and enforcement information is collected and entered by Regions and/or delegated States. Water pollution degrades surface waters making them unsafe for drinking, fishing, swimming, and other activities.

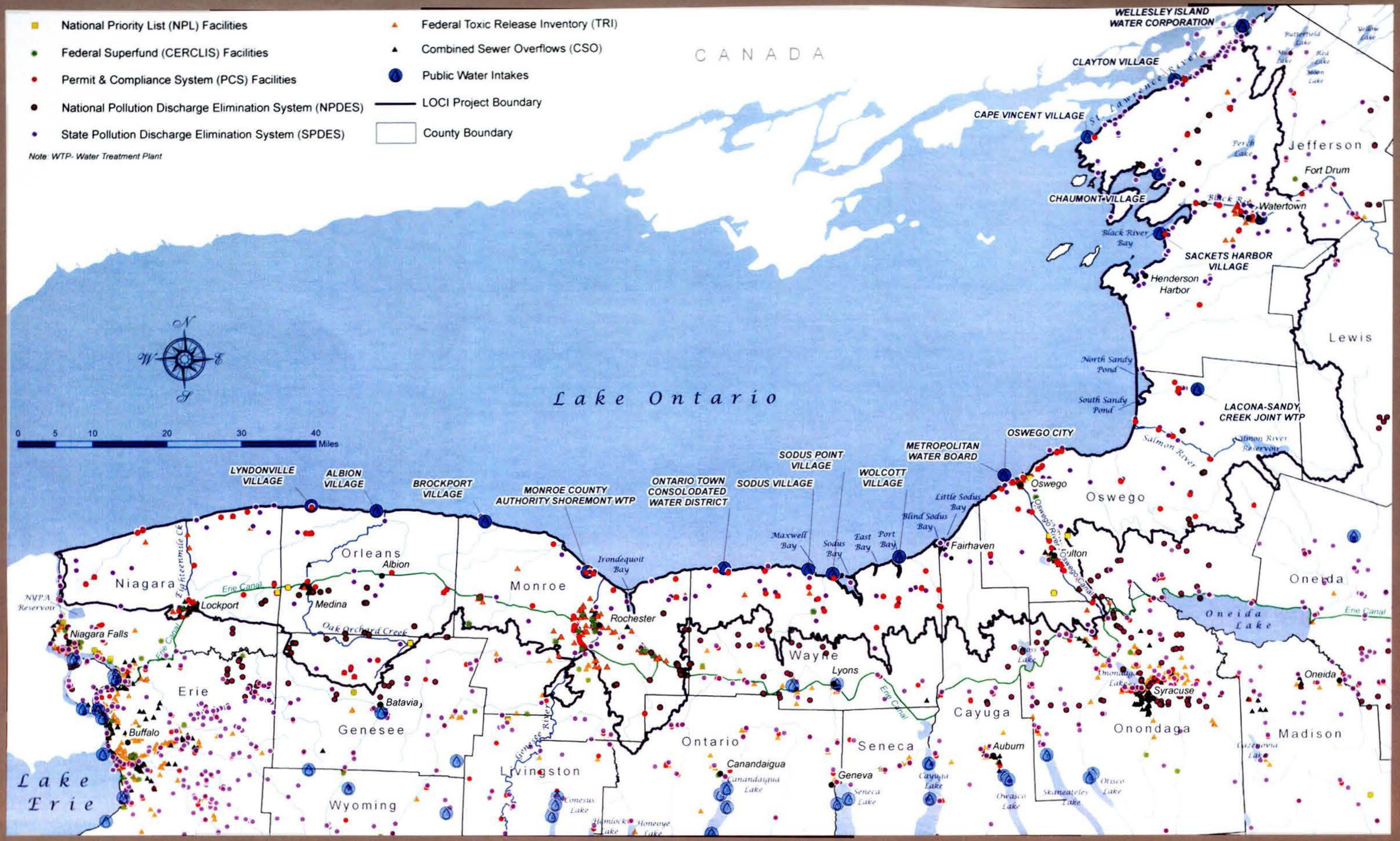
National Pollution Discharge Elimination Program: As authorized by the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Point sources are discrete conveyances, such as pipes or man-made ditches. Industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters.

The NPDES permits program consists of a number of initiatives focused on such areas as animal feeding operations, combined sewer overflows, pretreatment, sanitary sewer overflows, and stormwater. In most cases, the NPDES permit program is administered by authorized states. Under New York State law, the program is known as the **State Pollutant Discharge Elimination System** (SPDES) and is broader in scope than the Clean Water Act because it controls point source discharges to groundwaters, as well as surface waters.

Toxics Release Inventory The EPA and States are required to annually collect data on releases and transfers of certain toxic chemicals from industrial facilities, and make the data available to the public in the Toxics Release Inventory (TRI). EPA compiles the TRI data each year and makes it available through several data access tools. Armed with TRI data, communities have more power to hold companies accountable and make informed decisions about how toxic chemicals are to be managed. The data often spurs companies to focus on their chemical management practices since they are being measured and made public.

Combined Sewer Systems Combined sewer systems are sewers that are designed to collect rainwater runoff, domestic sewage, and industrial wastewater in the same pipe. Most of the time, combined sewer systems transport all of their wastewater to a sewage treatment plant, where it is treated and then discharged to a waterbody. However, during periods of heavy rainfall or snowmelt, combined sewer systems are designed to overflow occasionally and discharge excess wastewater directly to nearby streams, rivers, or other water bodies. These overflows, called combined sewer overflows (CSOs), contain not only stormwater but also untreated human and industrial waste, toxic materials, and debris. They are a major water pollution concern for the approximately 772 cities in the U.S. (Rochester, Watertown, and Fulton in the LODDB) that have combined sewer systems. EPA's CSO Control Policy is the national framework for control of CSOs. The Policy provides guidance on how communities with combined sewer systems can meet Clean Water Act goals in as flexible and cost-effective a manner as possible.

"We've reached the point in water management when if it's not water reuse, it's water abuse." – Don Beard, US Bureau of Reclamation Commissioner



10. Industrial And Municipal Permitted Discharges And Drinking Water Intake Locations

SOURCE: LOCI Superfund facilities, NPDES: Sept. 16, 2005; TRI, Outfall locations: US Environment Protection Agency, 2005; NYS Drinking water locations: NYSDOH Public drinking: Water Supply Database, 2001; SPDES: New York State DEC, 2005.

Bedrock and Unconsolidated Aquifers

Bedrock is the native consolidated rock underlying the surface of the earth. Most of the underlying geology of the two western Lake Ontario Direct Drainage Basin sections were formed in Upper Ordivician as part of the Medina Group and Queenstone Formation. The underlying rocks are Queenstone shale composed of red siltstones that lie across the entire southern section of the LODDB. These siltstones tend to increase in thickness moving from the Niagara River eastward to just south of Oswego. Most of the eastern Direct Drainage Basin is part of the Lorraine Group formed a little earlier in the Middle Ordivician. Going north from Oswego, this Direct Drainage area is characterized by:

- **Oswego Sandstone (with thin red or gray shales)**
- **Pulaski Formation (tan-gray siltstones, shales, light gray sandstone)**
- **Utica Shale (fissile black shales)**
- **The Trenton Group (Cobourg Limestone) in the Henderson Pond/Crystal Lake area.**

Aquifers and Formations

An aquifer is an underground layer of water-bearing permeable rock or unconsolidated materials (gravel, sand, silt, or clay) from which groundwater can be usefully extracted using a water well. The most productive aquifers in upstate New York consist of unconsolidated deposits of sand and gravel that occupy major river and stream valleys, or lake plains and terraces.

Sand and gravel formations were created when the glaciers melted and retreated. Lake clay deposits formed in the beds of glacial lakes, frequently covering sand and gravel beds deposited earlier. Sand and gravel beaches were formed, creating productive beach deposit aquifers. The large glacial lake that preceded Lake Ontario, named Lake Iroquois, was much larger than the present-day Lake Ontario. Lake Iroquois beach deposits are particularly well formed along the western edge of Tug Hill, north of Syracuse. Groundwater in these aquifers occurs under water-table (unconfined) or artesian (confined) conditions.

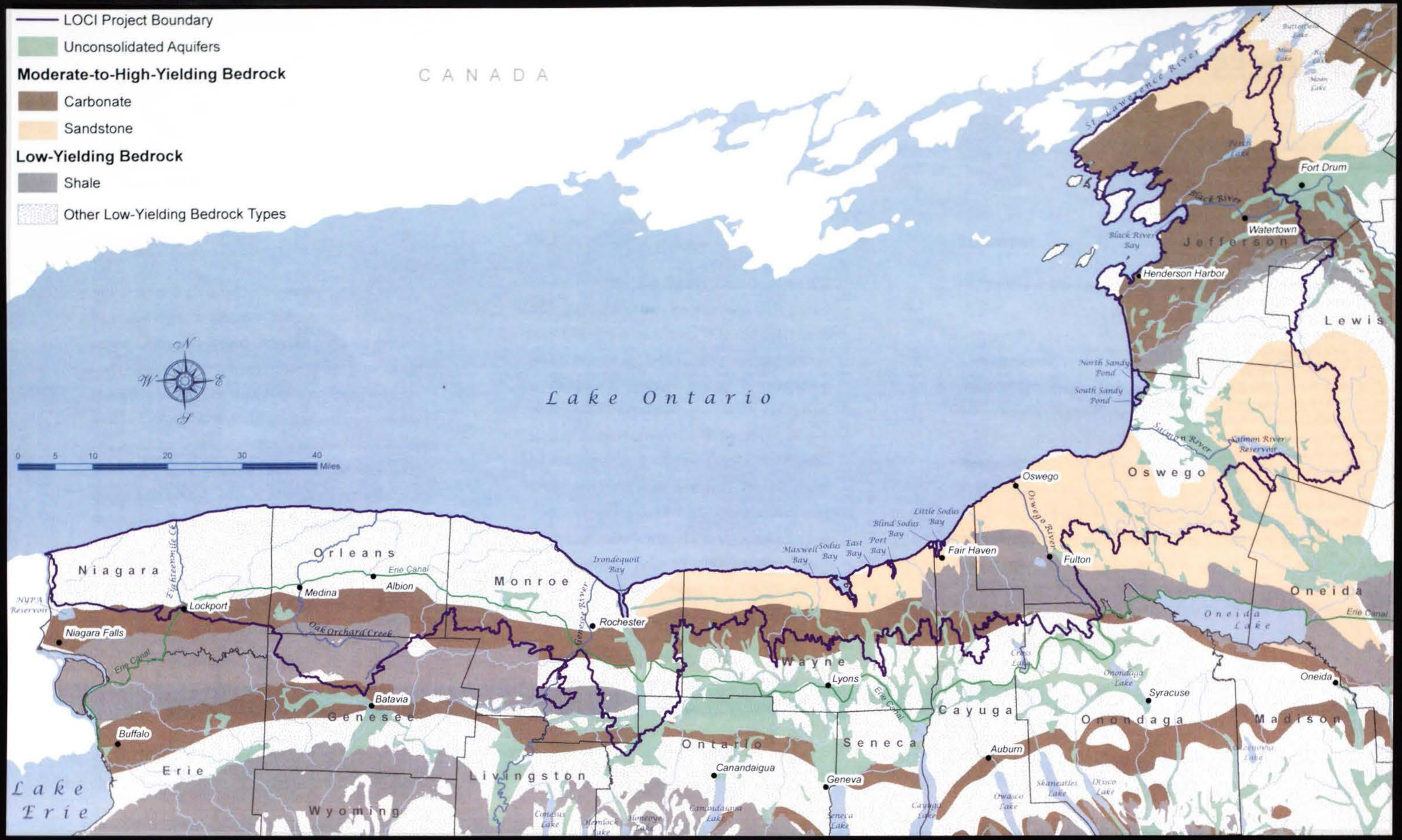
Well Yields

Well yields in bedrock may vary greatly, from less than one gallon per minute to more than 500 gallons per minute. These widely divergent well yields result from differences in bedrock formation. The density and size of openings in bedrock determines the capacity for water movement to sustain well yields. Some rocks are more porous than others; sandstone for example is more porous than granite. Fracturing also creates cracks and fissures; the degree of fracturing varies widely in bedrock formations.

High-yield aquifer formations can sustain well yields of more than 10 gallons per minute. Sand and gravel aquifers are the most highly productive aquifers in New York. These aquifers are capable of supplying large quantities of water, sufficient to meet commercial, industrial, and municipal needs.

Low-yield aquifers have sustained well yields of less than 10 gallons per minute, and may supply only enough water for individual homes and farms. Thin till formations, left by glaciers, containing a high percentage of clay and/or silt have low yields. Low yield wells sometime occur in otherwise high yield sand and gravel deposits due to the presence of interspersed layers of clay that block internal water movement in the aquifer.

"If there is magic on the planet, it is contained in water." – Loren Eiseley, The Immense Journey, 1957



11. Bedrock and Unconsolidated Aquifers

SOURCE: LOCI; New York State Aquifers; NYS Department of Health, Bureau of Public Water Supply Protection, 2001; Principal Aquifers of NYS; U.S. Geological Survey, 1998; Statewide Bedrock Geology; NYS Geological Survey, 1999.

SOURCES

Dr. Ted Endreny, P.H., P.E., Professor of Water Resources and Ecological Engineering, State University of New York College of Environmental Science & Forestry, Syracuse, NY
The Great Lakes Atlas, 3rd Edition, EPA: 905-B-95-001, 1995
www.census.gov/popest/counties/CO-EST2009-02.html
www.census.gov/geo/www/psapage.html#TRACTS
www.census.gov/popest/counties/CO-EST2009-02.html
www.dec.ny.gov/lands/48368.html
www.fllowpa.org/statebasin.pdf
en.wikipedia.org/wiki/Lake_Ontario
www.nps.gov/history/history/online_books/rec_area_survey/great-lakes/ny.htm
www.water.ca/sat-70508.asp
www.dec.ny.gov/docs/wildlife_pdf/ontariosetxt.pdf
ga.water.usgs.gov/edu/wwvisit.html
www.dec.ny.gov/docs/water_pdf/infrastructurerpt.pdf
www.fws.gov/refuges/profiles/index.cfm?id=52540
www.dec.ny.gov/61.html
www.fws.gov/refuges/profiles/index.cfm?id=52540
www.dec.ny.gov/lands/60135.html
www.dec.ny.gov/chemical/36741.html
www.fllowpa.org/publications.html
www.epa.gov/enviro/html/data_source.html
www.glc.org/living/
ecommons.cornell.edu/bitstream/1813/3406/2/Aquifers.pdf
www.dos.state.ny.us/lgss/pdfs/RuralResourceSurvey.pdf
www.lewiscountyny.org/content/Generic/View/20:field=documents;/content/Documents/File/862.pdf

NEW YORK SEA GRANT

New York Sea Grant (NYSG) is a statewide network of integrated research, education, and extension programs promoting the wise use and protection of marine and Great Lakes resources. The combined talents of university scientists and extension specialists help transfer science-based information to many coastal user groups--businesses and industries, federal, state and local government decision-makers and agency managers, educators, the media and the interested public. NYSG is a cooperative program of the State University of New York (SUNY) and Cornell University.

www.nyseagrant.org

LOCI

The mission of the Lake Ontario Coastal Initiative (LOCI), encompassing all of the New York State north coast stakeholders from the Niagara River to the St. Lawrence River, is to enlist and retain broad public commitment for remediation, restoration, protection, conservation and sustainable use of the coastal region. LOCI's goal is to coordinate efforts to remediate, restore, protect and sustainably use the Lake Ontario Coastal region, Upstate New York's world class asset. The LOCI project brings together the Center for Environmental Information and partners including the Finger Lakes-Lake Ontario Water Protection Alliance (FL-LOWPA), SUNY Brockport Department of Environmental Sciences and Biology, and others representing public and private stakeholders.

www.ceinfo.org/loci/index.php

FLLOWPA

FL-LOWPA is an alliance of 25 counties wholly or partially in the New York Lake Ontario Basin. It's mission is to protect and enhance water resources by:

1. Promoting the sharing of information, data, ideas, and resources pertaining to the management of watersheds in New York's Lake Ontario Basin;

2. Fostering dynamic and collaborative watershed management programs and partnerships; and

3. Emphasizing a holistic, ecosystem-based approach to water quality improvement and protection.

A unique facet of FL-LOWPA is a commitment to developing local solutions to meet local water quality needs while promoting the integration and transfer of tools and information to enhance the regional effectiveness of water resources management.

www.fllowpa.org